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Appl. No. 10/762,164
Reply to Office Action of July 17, 2006

Attorney Docket No. 2002-0246 / 24061.477
Customer No. 42717

REMARKS

Claims 42-48 have been added. Claims 28-48 are pending in the application. Applicants have previously paid filing fees in an amount sufficient to cover all of the claims that are now pending, and thus no additional filing fee is due in association with the submission of this Amendment. In view of the remarks that follow, Applicants respectfully request reconsideration.

Allowed Claims

Noted with appreciation is the indication in the Office Action that Claims 29-30, 32, 34-36 and 38-39 are all still allowed.

Objection to Incomplete Office Action

Applicants respectfully object to the Office Action on the ground that it is not complete. More specifically, on June 23, 2006 Applicants filed a Response that canceled Claims 20-22 and 24-27, leaving only Claims 28-41 in the application (all of which had been allowed). As explained in the remarks of that June 23 Response, Applicants believed that Claims 20-22 and 24-27 were allowable, and canceled these claims only so that this application would immediately proceed to allowance with other claims that had been allowed.

Thereafter, however, the Examiner decided to withdraw the allowance of Claims 28, 31, 33, 37 and 40-41, and re-open prosecution on the merits. But if the present application is not going to allowance as promised, then Applicants are not willing to cancel Claims 20-22 and 24-27, and instead intend that the subject matter of these claims will remain in the application for further consideration on the merits. The Examiner was aware that Applicants canceled Claims 20-22 and 24-27 in direct reliance on the Examiner's indication that this application would be sent to allowance. When the Examiner later decided to re-open prosecution on the merits, it is respectfully submitted that the Examiner should have given Applicants advance notice, so that Applicants could reinstate the subject matter of Claims 20-22 and 24-27 before issuance of an office action. Consequently, to the extent that the present Office Action fails to

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consider the subject matter of Claims 20-22 and 24-27 on the merits, it is respectfully submitted that the Office Action is not complete, and must be withdrawn.

Canceled Claims 20-22 and 24-27 cannot be directly reinstated with their original claims numbers. Therefore, the foregoing amendments add new Claims 42-48, which are respectively identical to prior Claims 20-22 and 24-27. It is respectfully submitted that the present Office Action must be withdrawn, and replaced with a new and non-final Office Action that considers the merits of all of Claims 28-48.

In an effort to expedite the examination of this application, the remarks below address the claim rejections that are set forth in the incomplete Office Action. However, this is not a waiver of Applicants' objection to the incompleteness of the Office Action.

Independent Claim 28

As noted above, independent Claim 28 was previously allowed, but the Examiner has now withdrawn that allowance in order to set forth a rejection of Claim 28. In particular, Claim 28 stands rejected under 35 U.S.C. §103 as obvious in view of a proposed combination of teachings from Yu U.S. Patent No. 6,784,101 and Rim U.S. Patent No. 6,603,156. This rejection is respectfully traversed. The PTO specifies in MPEP §2142 that:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that Yu and Rim fail to establish a *prima facie* case of obviousness under §103 with respect to Claim 28, for several mutually exclusive reasons that are discussed separately below.

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YU AND RIM FAIL TO TEACH ALL OF THE CLAIM LIMITATIONS

The provisions of MPEP §2142 specify with respect to §103 that:

To establish a *prima facie* case of obviousness . . . the prior art reference (or references when combined) must teach or suggest all the claim limitations. (Emphasis added).

The PTO considers this requirement to be important, as evidenced by the fact that this exact language appears not only in MPEP §2142, but also in other sections of the MPEP, including MPEP §706.02(j) and MPEP §2143. Applicants' Claim 28 includes a recitation of:

. . . a strained substrate . . . comprising an uppermost strained-Si epi layer, a middle relaxed $\text{Si}_{1-x}\text{Ge}_x$ layer and a lowermost graded $\text{Si}_{1-y}\text{Ge}_y$ layer;
at least one dielectric gate oxide portion over the strained substrate, the at least one dielectric gate oxide portion having a dielectric constant of greater than about 4.0; and
a device over each of the at least one dielectric gate oxide portion to complete the at least one high-k device.

The Office Action relies on Figure 7 of Yu, which discloses a relaxed SiGe layer 3, a high-k dielectric layer 6', and a device gate electrode 8. However, Figure 7 of Yu does not disclose a strained epi-Si layer or a second graded SiGe layer. In an attempt to cure these deficiencies in Yu, the Office Action turns to Rim, and in particular to Figure 1 of Rim. Figure 1 of Rim depicts a process flow that progresses from left to right, and that shows several different ways to fabricate a structure 10 shown at the right side of Figure 1. The structure 10 has a strained epi-Si layer 12, an insulator layer 14, and a layer 24 that serves as a "handle". However, the final

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structure 10 of Figure 1 does not include a graded SiGe layer. Consequently, even when Figure 7 of Yu and Figure 1 of Rim are considered together, they show only one graded SiGe layer (at 3 in Figure 7 of Yu). Since they do not show two different SiGe layers, they fail to satisfy the requirement of MPEP §2142 that their combined teachings must "teach or suggest all the claim limitations" (emphasis added). Therefore, for this independent reason alone, it is respectfully submitted that Claim 28 is not rendered obvious under §103 by Yu and Rim, and notice to that effect is respectfully requested.

PTO MUST CONSIDER INVENTION AS A WHOLE, NOT JUST A DIFFERENCE

In the present Office Action, the Examiner indicates that Yu discloses a device with a strained layer, but acknowledges that there are differences between Yu and the subject matter of Claim 28. For example, the Examiner admits that "Yu et al. fail to disclose the required epi-silicon structure". The Examiner then focuses on this difference, and goes off to look for a reference that discloses this difference.

More specifically, the Examiner notes that Figure 1 of Rim discloses a strained epi-Si layer at 12. As noted above, Rim's Figure 1 shows a process flow from left to right, and the relevant part of Figure 1 is the final structure 10 shown on the right. This structure 10 has a strained epi-Si layer 12, an insulator layer 14, and a layer 24 that serves as a "handle". Aside from the presence of the strained epi-Si layer 12, the structure 10 bears little or no resemblance to anything disclosed in Yu or anything recited in Claim 28. In regard to the subject matter of Claim 28, Rim basically discloses just a strained epi-Si layer, and nothing else of interest.

Thus, the Office Action identifies a difference between Yu and Claim 28 (a strained epi-Si layer), and then focuses solely on this difference, without regard to context. In effect, the Examiner assumes that if a strained epi-Si layer can itself be shown to be obvious, then Applicants' overall invention must also necessarily be obvious. But this approach is expressly prohibited by MPEP §2141.02, which emphasizes that:

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THE CLAIMED INVENTION MUST BE CONSIDERED
AS A WHOLE

In determining the differences between the prior art and the claims, the question under 35 U.S.C. §103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. (Emphasis in original).

Applicants respectfully submit that the approach taken in the Office Action runs afoul of this MPEP requirement. Accordingly, for this independent reason alone, it is respectfully submitted that, when considered as a whole, Claim 28 is not rendered obvious under §103 by Yu and Rim.

THERE IS NO MOTIVATION TO MAKE THE PROPOSED COMBINATION
MPEP §2142 specifies that:

To establish a *prima facie* case of obviousness . . . there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. . . . The teaching or suggestion to make the claimed combination . . . must . . . be found in the prior art, and not based on applicant's disclosure.

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In the present Office Action, the Examiner asserts that:

It would have been obvious to one of . . . ordinary skill in the art at the time the invention was made to include the required epi-silicon layer . . . in Yu et al. as taught by Rim in order to have a semiconductor device with increased reliability and performance.

There are at least two problems with this statement. First, as discussed above, Yu not only lacks a strained epi-Si layer, but also has only one SiGe layer, whereas Claim 28 recites two different SiGe layers. The statement quoted from the Office Action about motivation says absolutely nothing about motivation in regard to the second SiGe layer. In particular, the Office Action does not identify any prior art that teaches the use of two different SiGe layers, and the quoted statement about motivation offers no explanation about why a person skilled in the art would be motivated to modify Yu to provide two different SiGe layers, especially since the rejection is based on prior art that does not disclose the use of two different SiGe layers.

Second, in regard to the strained epi-Si layer, the quoted statement regarding motivation asserts that it would be obvious to modify Yu to replace the semiconductor layer 2 with the strained epi-Si layer 12 of Rim "in order to have a device with increased reliability and performance". This statement about "increased reliability and performance" is a conclusory assertion that is not supported by the citation of any specific statement in Rim about either reliability or performance. And even assuming Rim indicated that his strained epi-Si layer 12 served to enhance either reliability or performance of the structure shown at 10 in Figure 1 of Rim, Rim's structure 10 is so radically different from the structure shown in Figure 7 of Yu that there is no reason to believe the strained epi-Si layer 12 of Rim would serve to increase either reliability or performance in the radically different device of Yu. Consequently, as to the strained epi-Si layer, the Office Action does not show any proper motivation for making the proposed combination.

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MPEP §2142 provides that:

To reach a proper determination under §103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. . . . Knowledge of applicant's disclosure must be put aside in reaching this determination, . . . impermissible hindsight must be avoided, and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

In the present Office Action, the rejection of Claim 28 based on Yu and Rim is actually nothing more than a hindsight reconstruction of Applicants' device. Using Applicants' disclosure as a blueprint, the Examiner selectively extracted isolated structural features from both Yu and Rim, and then combined these isolated features with a 20/20 view of the desired result. As part of this, the idea of using two different SiGe layers was clearly pulled from Applicants' disclosure and not the prior art, because it is certainly not taught in the indicated portions of either Yu or Rim. This is a classic example of hindsight reconstruction. Examiners frequently attempt to justify the use of hindsight by turning to PTO Form Paragraph 7.37.03, which states that "any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning". However, even this form paragraph goes on to emphasize that hindsight is permissible only to the extent that it "does not include knowledge gleaned only from the applicant's disclosure" (emphasis added). Here, Yu and Rim cannot possibly render the subject matter of Claim 28 obvious, unless the analysis also includes hindsight of Applicant's disclosure. But MPEP §2142 and Form Paragraph 7.37.03 both make it very clear that hindsight of Applicant's disclosure cannot be used under §103. Accordingly, for this independent reason alone, it is respectfully

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submitted that Claim 28 is not rendered obvious under §103 by Yu and Rim, and notice to that effect is respectfully requested.

For each of the various different reasons discussed above, it is respectfully submitted that the Office Action fails to establish a prima facie case of obviousness with respect to Claim 28. Accordingly, Claim 28 is not rendered obvious under §103 by Yu and Rim. Claim 28 is therefore believed to be allowable, and notice to that effect is respectfully requested.

Independent Claims 33 and 41

As noted above, independent Claims 33 and 41 were each previously allowed, but the Examiner has now withdrawn that allowance in order to set forth a rejection of Claims 33 and 41. In particular, Claims 33 and 41 each stand rejected under 35 U.S.C. §103 as obvious in view of Yu and Rim. These rejections are respectfully traversed. Claim 33 includes a recitation of:

... a strained substrate ... comprising an uppermost strained-Si epi layer over an upper relaxed $\text{Si}_{1-x}\text{Ge}_x$ layer over a graded $\text{Si}_{1-y}\text{Ge}_y$ layer over an epi layer over a lowermost relaxed $\text{Si}_{1-z}\text{Ge}_z$ layer, wherein $x \geq y \geq z$;

Claim 41 includes a recitation of:

... a strained substrate ... comprising an uppermost strained-Si epi layer, a relaxed $\text{Si}_{1-y}\text{Ge}_y$ layer under the uppermost strained-Si epi layer, a constant $\text{Si}_{1-y}\text{Ge}_y$ layer under the relaxed $\text{Si}_{1-y}\text{Ge}_y$ layer, a silicon epi layer under the constant $\text{Si}_{1-y}\text{Ge}_y$ layer, and a constant $\text{Si}_{1-z}\text{Ge}_z$ layer under the silicon epi layer, wherein the uppermost relaxed-Si epi layer is comprised of $\text{Si}_{1-x}\text{Ge}_x$ wherein x is constant or graded;

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The rationale given in the Office Action for the rejection of Claims 33 and 41 is the same rationale given for the rejection of Claim 28. Claims 33 and 41 each recite a strained epi-Si layer and, for the same basic reasons discussed above in association with Claim 28, it is respectfully submitted that it would not be obvious in view of Figure 1 of Rim to provide a strained epi-Si layer in the device shown in Figure 7 of Yu. In addition, Claims 33 and 41 each recite an arrangement that has three different SiGe layers with an embedded epi layer. The idea for this arrangement is clearly being pulled from Applicants' disclosure through the improper use of hindsight, because it is certainly not taught in the indicated portions of either Yu or Rim.

Accordingly, it is respectfully submitted that the Office Action fails to establish a prima facie case of obviousness for either of Claims 33 and 41 based on Yu and Rim. Claims 33 and 41 are therefore believed to be allowable, and notice to that effect is respectfully requested.

Independent Claim 31

As noted above, independent Claim 31 was previously allowed, but the Examiner has now withdrawn that allowance in order to set forth a rejection of Claim 31. In particular, Claim 31 stands rejected under 35 U.S.C. §103 as obvious in view of Yu and Rim. This rejection is respectfully traversed. Claim 31 includes a recitation of:

... a strained substrate ... comprising an uppermost strained-Si epi layer, a middle $\text{Si}_{1-x}\text{Ge}_x$ layer and a lower silicon oxide layer;

The rationale given in the Office Action for the rejection of Claim 31 is the same rationale given for the rejection of Claim 28. Claim 31 recites a strained epi-Si layer and, for the same basic reasons discussed above in association with Claim 28, it is respectfully submitted that it would not be obvious in view of Figure 1 of Rim to provide a strained epi-Si layer in the device shown

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in Figure 7 of Yu. It is respectfully submitted that idea for this proposed modification is clearly being pulled from Applicants' disclosure through the improper use of hindsight. Accordingly, it is respectfully submitted that the Office Action fails to establish a prima facie case of obviousness for Claim 31 based on Yu and Rim. Claim 31 is therefore believed to be allowable, and notice to that effect is respectfully requested.

Dependent Claim 37

Claim 37 depends from independent Claim 33, and is also believed to be distinct from the art of record, for example for the same reasons discussed above with respect to Claim 33.

Conclusion

Based on the foregoing, it is respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to telephone the undersigned attorney at 972-739-8647.

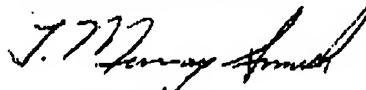
Although Applicants believe that no fee is due in association with the filing of this Response, the Commissioner is hereby authorized to charge any additional fee required by this

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paper, or to credit any overpayment, to Deposit Account No. 08-1394 of Haynes and Boone LLP.

Respectfully submitted,



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